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DIAGNOSIS AND TREATMENT OF BASAL CELL EPITHELIOMA.*

WITH THE REPORT OF 59 CASES.

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From the standpoint of the general practitioner, three types of epithelioma most frequently are encountered. These are of the greatest importance from the viewpoint of diagnosis, prognosis, and treatment. We may for the sake of convenience divide epithelioma into three large groups:

1. Basal cell epithelioma, with which we are chiefly concerned in this paper.
2. The prickle cell epithelioma or so-called spinocell epithelioma which forms pearls.
3. The mucous membrane epithelioma which springs from mucous membrane surfaces.

The second and third groups, namely the prickle cell epithelioma and the mucous membrane epithelioma will be reported on at some future time.

In the first group, basal cell epithelioma or carcinoma, as it is sometimes called, about 90% of the cases appear on the face, chiefly affecting the nose, cheeks, forehead, and eyelids, all notably above a line drawn on a level with the upper lip. They sometimes occur on the hands, arms, legs, shoulders, and abdomen, of which we had one very remarkable case.

Basal cell epithelioma is rare before the age of thirty years and most common between the ages of forty to fifty according to various authors. The ages of our cases were as follows: in the fourth decade there were two cases; in the fifth, nine cases; in the sixth, seventeen; in the seventh, there were twenty; in the eighth, there were eight; and in the ninth there were three. The ratio that usually is given between male and female is three to one. Of our cases there were thirty-seven males and twenty-two females.

The lesions may occur singly but multiplicity of the lesions is noteworthy in this type of growth.

The duration of the lesions in our cases before they came to treatment varied from three months to twenty years.

The first thing noticed by twenty of the patients was a pimple; warts, moles, scaly spots by twenty-three others. Six others did not remember how the lesion began. A history of trauma, either contusion, a scab, or burns was recorded in ten cases.

PATHOLOGY.

In 1903 Krompecher described and gave the name of "basal cell carcinoma" to certain tumors which differed histologically from the ordinary pearl-forming epithelioma. Before this time these tumors were

Fig. 1.

designated by various names, as sarcoma, adenoid epithelioma, and especially by Braun, as endothelioma. Krompecher made a very careful study of the literature but acknowledged that he was much confused concerning what was really meant by the tumors described by different authors.

Krompecher believed that this type of tumor took its origin either from the columnar basal layer of the epidermis or from the basal cells of the hair follicles or skin glands. The following year Borrman made extensive studies of this type of tumor, agreeing with Krompecher that they were not endothelioma, but true epithelial tumors, but disagreed concerning their origin, believing that they sprang from embryonal nests of the skin epithelium and only became connected with the skin epithelium as shown in Krompecher's illustrations, secondarily. Borrman gave to these tumors the name of "corium carcinoma." Mallory believes that these tumors always spring from the hair matrix cells and has

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named them "hair matrix carcinoma," It is probable that the site of origin is from the basal cells, either of the epidermis, hair follicles or skin glands and probably quite frequently from the pre-existing benign tumors of the skin glands, and also of nevi, for many of these tumors are accompanied by a preceding history of a nodule existing for a number of years, most always with an increasing rapidity of growth during the few preceding months. One of our lesions showed a distinct transformation from a sebaceous adenoma; and in one other instance these tumors, which were multiple, occurred in the axilla and groin following a chronic seborrhea which had existed for a number of years.

Grossly, these tumors may vary in size from the head of a pin to the size of an orange and while they

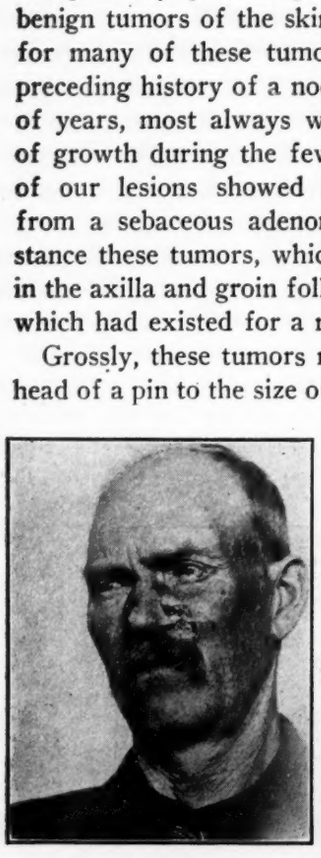

Fig. 2—Before Treatment.

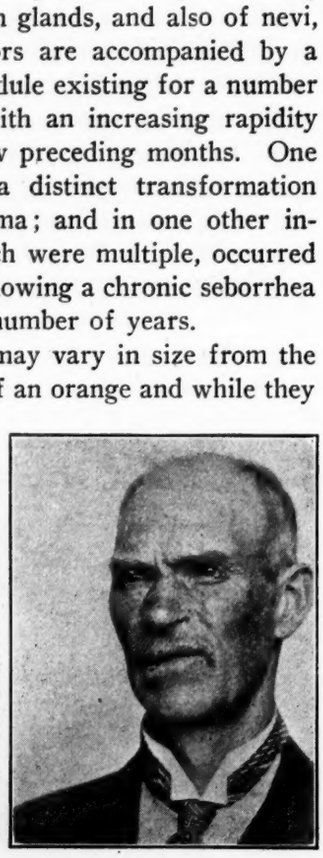

Fig. 3—After Treatment.

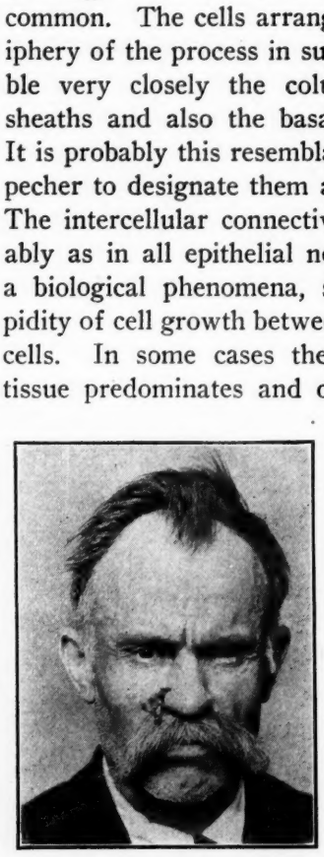

Fig. 4—Before Treatment.

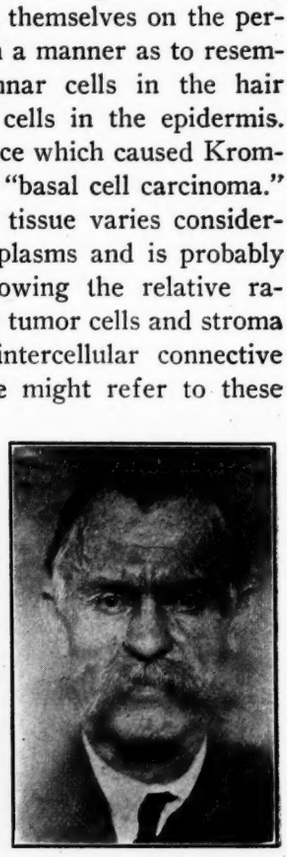

Fig. 5—After Treatment.

are usually nodular, they may also be irregular in shape. Very frequently they are elevated and may even be papillar. They are situated superficially in the skin and have a great tendency to ulcerate. On the cut surface they may be solid or may have a cystic appearance.

Histologically they all may be divided into two general groups: the one, solid and the other, alveolar. The solid variety which comprises 75% of these tumors, is made up of solid masses of cells which have a tendency to form processes which penetrate into the connective tissue of the corium forming a picture which has been likened to point lace. The cells may be round or spindle shaped, depending probably upon pressure and resistance conditions. The alveolar form, which comprises 25%, usually occur with an adenomateous appearance or in some cases may be tubular, in which case the tubules sometimes resemble very strikingly the ducts of the suderiferous glands. Occasionally the alveoli become enlarged, causing a cystic appearance. In about 15% of the cases there were tumors which showed a mixture of these types.

The tumor cell in all types is about the same, being composed of small cells, round, cuboidal or spindle, with scanty protoplasm, and with a deeply staining, solid nucleus. Mitotic figures are very common. The cells arrange themselves on the periphery of the process in such a manner as to resemble very closely the columnar cells in the hair sheaths and also the basal cells in the epidermis. It is probably this resemblance which caused Krompecher to designate them as "basal cell carcinoma." The intercellular connective tissue varies considerably as in all epithelial neoplasms and is probably a biological phenomena, showing the relative rapidity of cell growth between tumor cells and stroma cells. In some cases the intercellular connective tissue predominates and one might refer to these tumors as scirrhus. Metastases have not been observed in this series of cases.

These lesions run a more or less slow course according to the rapidity of the neoplastic growth, the nutrition of the part, and the resistance of the invaded tissue. As long as the epidermis remains intact, that is, as long as there is no ulceration, (in our cases this would include those that were reported as pimples, warts, and moles), the growth is extremely slow. After ulceration has occurred the cells multiply very rapidly. If they are unable to invade the surrounding tissue a fungus-like growth is the result. The lesion may heal in part spontaneously, but never entirely.

The classifications which have been made by different authors based on the clinical aspects represent only different stages in the development of some of the neoplasms, certain factors being common to all of them, only the clinical expression of the disease varying when we speak of rodent ulcer, or rolled edge ulcer, etc. According to the clinical course, some authors divide basal cell epithelioma into seven groups:

1. Flat rodent ulcer.
2. Nodular epithelioma.
3. Rolled edge epithelioma.
4. The depressed scar-like cancer.
5. Morphea-like.
6. Fungating epithelioma.
7. Deep ulcerating.

This is Harry H. Hazen's classification in his book on "Skin Cancer."

I. The flat rodent ulcer is the most common. It begins usually as a reddish or pearl gray, smooth nodule with superficial ulceration taking place early. The ulcerated area is covered by an adherent black or dark brown crust which, from time to time, drops off or is picked off by the patient. When this occurs there is slight bleeding and the ulcerated area becomes larger. The growth is always slow and may take from one to ten years to attain the diameter of one to two centimeters. Induration is always present. On inspection with a hand lens small pearly nodules can be seen just at the edge of the ulceration. The skin around the edge looks shiny and is under tension. The tissue beneath the scab looks like ordinary *granulation* tissue. If this lesion is undisturbed or ineffectually treated one of several things may happen; first, there may be widespread superficial ulceration with or without the formation of fungating tumor masses (like group 6); second, there may be invasion and destruction of the neighboring tissues resulting in large ulcerating cavities which may become secondarily infected with the ordinary pus-forming organisms or putrefactive bacteria. In one of our cases the orbital cavity was involved with complete destruction of the orbit. In two cases the aural cavity was invaded, in one case, the auditory meatus and, in the other, invasion of the temporal bone and mastoid cells with the destruction of the tables of the skull; and later an infection of the meninges which resulted in death. Thirdly, an attempt at healing may take place with the formation of a depressed scar, as in the fourth group, described by Hazen. The edge of the ulcer is slightly elevated and always indurated, the induration being due to the inflammation which usually exists, as well as the multiplication of cells. The diagnosis in the early stages of these growths may be confused with hyperkeratosis, or more rarely some of the simple inflammations. After the ulceration appears, syphilis and lupus vulgaris must be considered.

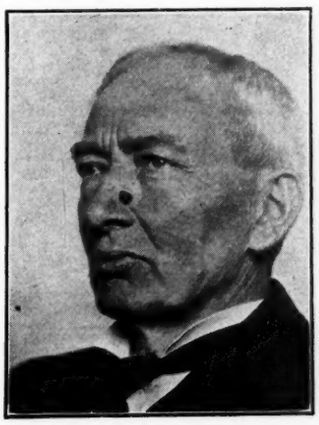

Fig. 6—Before Treatment.

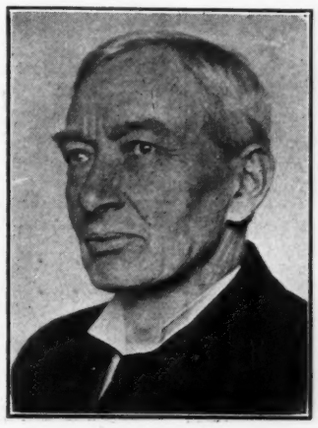

Fig. 7—After Treatment.

II. The second group of Hazen's, the nodular type, usually arises from a preëxisting lesion which the patient may describe as a pimple, a wart, or a mole. A pearly nodule first forms and grows slowly, which in the course of a year or two may attain the size of one centimeter and be elevated above the surrounding skin. It is hard and firm to the touch, of a white or greyish appearance, with small dilated vessels running into the tumor. Later ulceration occurs and assumes the type of a rodent ulcer.

III. The rolled edge ulcer. We have observed one case on the abdomen. They grow much more rapidly and may be slow to ulcerate. These growths have a distinct semi-globular edge with a depression in the center, the edge is extremely hard and the skin over it is tense, thick, and shiny. There are numerous dilated vessels extending into the normal skin. The late course of this type of basal cell epithelioma is the same as that of the two preceding types.

IV. The depressed scar-like epitheliomas usually start as a small subepidermal nodule, the skin over it remaining intact. They commonly are seen on the cheeks and temples. The nodule flattens out and slowly spreads below an edge of rete and as a result the appearance is identical with that of a depressed scar.

V. The morphea-like epithelioma has been described in detail by Heidingsfeld, *Journal Cutaneous*

Diseases, 1913, *XXXI,* 379. These lesions start as small nodules situated on the temples or malar eminences and are sharply defined and spread very slowly, taking four or five years to reach the diameter of one to two centimeters. They are sharply defined lesions with slightly elevated pearly border, the center white or yellow-white and depressed. The edges are very hard to the touch and the center feels leathery. There may be smaller ulcerated areas along the edges or in the center of the growth. We have not observed this type.

VI. The fungating basal cell epithelioma is usually caused by the cells proliferating more rapidly than they can invade, so that the growth must necessarily be outward. The surface may be smooth and resemble anemic granulation tissue, although they bleed at the slightest provocation. This type of tumor must be differentiated from the rapid-growing fungating type of pearl forming epithelioma as well as from some of the granulomata, granuloma pyogenicum, blastomycocis, and simple exuberant granulation tissue.

Fig. 8—Before Treatment.

Fig. 9—After Treatment.

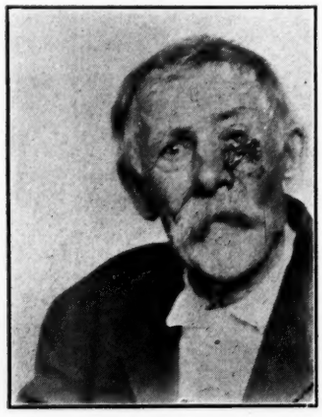

Fig. 10.

VII. The deep ulcer type is usually the result of injudicious treatment. The base of the ulcer is usually very irregular, with much discharge of pus of a foul odor, and the patient is toxic from absorption. Death usually takes places from hemorrhage or infection.

In the diagnosis of basal cell epithelioma, the following points are important: first, its location; second, the spontaneous origin of the lesion, from a pimple, wart, mole, or scaling skin (hyperkeratosis); third, the slow growth; fourth, the induration which exists no matter how small the lesion is; fifth, the progressive nature of the lesion, attempts at healing but never healing entirely; sixth, metastases are rarely if ever observed; seventh, biopsy, this being the only positive way of distinguishing between basal cell epithelioma and early prickle cell epithelioma in which there is no metastasis.

As the basal cell epithelioma of the skin is a superficial tumor, it, therefore, does not seem difficult to destroy all cancerous tissue and thus obtain a permanent cure. Even rather advanced cases are amenable to treatment. The infrequency of metastases increases the chances for a permanent cure, yet in spite of this there are among our cases many who had previously received medical attention without success. *X*-ray, caustics, and the thermocautery had been used or the tumor had been removed surgically. The effect was either a speedy recurrence after temporary healing, or a more rapid extension of the lesion.

For the treatment in our cases we used the following procedures, either alone or combined: fulguration, excision, radium and *x*-ray treatment.

Fulguration has only a local effect which is practically the same as cauterization or coagulation of the tissue. It does not possess any advantage over the thermocautery in the treatment of basal cell epithelioma. We treated only two cases with fulguration. One of them healed promptly within 23 days, the other was fulgurated several times but remained stationary and healing at last was obtained by radiation.

Six basal cell epitheliomas were excised. All patients so treated were healed and remained well, some of them for more than three years. This success may be explained by the fact that we operated only on carefully selected cases. Not all cases, owing to their size and location, causes dealt with surgically.

In 19 cases we applied radium. We used it in the form of radium bromide, of which 51 mgs. were applied in metal applicator. In 9 cases the treatment was successful and a clinical cure has been obtained. One of these cases, however, sustained a severe radium burn which healed only after eight

months. In another case of this group it is doubtful whether the success can be ascribed to the effect of the radium alone. This patient with an ulcerated lesion on his nose had been fulgurated twice without success. Then he received within sixteen days two mild erythema doses of unfiltered *x*-rays, whereupon his lesion showed considerable improvement. Eight days after the last *x*-ray treatment, before the full effect of the *x*-rays had time to develop, the ulcer was radiated for three hours with radium. It is, therefore, not improbable that this lesion might have healed without the radium application. The favorable influence of the radium rays in the successful treatments could usually be noticed after two weeks, while it took from 1-2 months from the beginning of the treatment until the lesion had disappeared. One patient is still under treatment, almost well. In the nine remaining cases the radium treatment did not prove satisfactory. Some of these showed at first some improvement, but then remained stationary; in one case the ulcer even progressed. Three of these cases which were refractory to radium were later on treated with *x*-rays and were healed promptly. On the other hand, among these nine cases were four which had not responded to many applications of *x*-rays and which also could not be influenced by radium. Our success with radium in basal cell epithelioma (50%) is, therefore, not very encouraging. Perhaps the amount of radium at our disposal is not sufficient for all cases, though it was large enough to produce a burn; perhaps we have not yet found the proper technic as to the filtration and doses of the radium. It is also possible that the failure of the radium treatment in some cases is due to the quality of the radium rays; their wave-length is probably too short and their penetration too high to be sufficiently absorbed by the tissue.

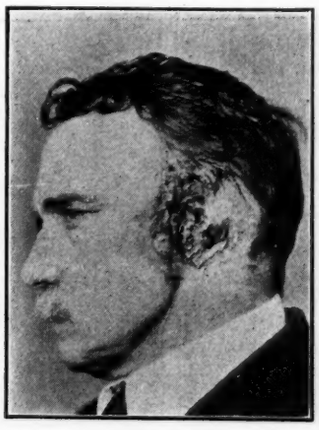

Fig. 11.

Fig. 12—Before Treatment.

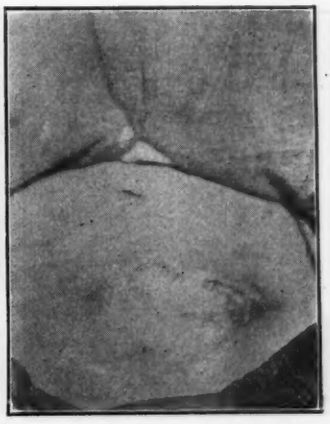

Fig. 13—After Treatment.

Fifty-four cases have been treated with *x*-rays. They can be divided into two groups. The first group contains thirteen cases which were treated with fractional filtered and unfiltered *x*-ray doses of varying penetration. Most of these cases showed a slight erythema; four of these thirteen cases remained refractory after temporary improvement. The other nine cases were pronounced clinically well within 3-10 weeks and are well at this time.

The second group contains forty-one cases, eleven of which are still under treatment. With these the was to destroy, if possible, with a single erythema dose all carcinomatous tissue. All were ulcerated, and in all the ulcerated lesion healed. In only one instance the scar remained slightly elevated. It is to be regretted that this patient did not report for further observation and treatment. All other cases (97%) healed with scars that were quite satisfactory from a cosmetic point of view. The deliberately produced erythema of the skin did not inconvenience the patient in any way and disappeared after 2-3 weeks. The first improvement was usually noticed 1-2 weeks after the application of *x*-rays. The time required for healing varied between 3 and 6 weeks and depended upon the size of the new-growth. The time necessary for healing was prolonged somewhat in two patients who suffered from very extensive tumors which had already invaded the deeper layers of the subcutis.

The difference between these two groups is too great to be overlooked and speaks decidedly in favor of the so-called "massive dose treatment," which consists of few rather powerful applications, as recommended by MacKee and Remer and by Pusey. The treatment with frequent small doses, the so-called "fractional dose" method, originated from the idea that it would not damage the healthy skin and tissue overlying the tumor. Of course it is absolutely necessary to pay strict attention to the skin when giving the so-called "deep *x*-ray treat-

ment," but the basal cell epitheliomas of the skin are more or less superficial tumors of the cutis and subcutis that ulcerate and, if not cured, will destroy the skin progressively and much more thoroughly than it could ever be damaged by two or three erythema doses given at intervals of 3-4 weeks. It is a well known experience of all who treat neoplasms with *x*-ray or radium that tumors may become resistant against radiation by the application of many small doses and then will continue their destructive growth uninfluenced. We have several such cases in the first group of our *x*-rayed patients. In our opinion the risk of underdosing when treating with *x*-rays is usually very much under-rated. The consequence of underdosing in a skin epithelioma is much more serious than a marked acute erythema of the skin that disappears in 2-3 weeks without leaving any trace. It is, moreover, not at all impossible that the hyperemia of the skin produced by the erythema influences favorably the progress of healing. Though we know very little at present about the mechanism of healing after *x*-ray treatment, it is conceivable that besides the destructive effect of the rays on the cells, cytolysins which are present in the blood may play an important part. From this point of view a deliberately produced hyperemia may therefore increase the direct effect of the *x*-rays. We can absolutely limit the effect of the rays to the smallest possible area by using proper diaphragms and by covering the surrounding skin with sheets of rubber impregnated with lead. The only danger is that we may choose too small an area, the consequence of which will be a recurrence.

When teating skin epitheliomas, as a rule, we do not use any filter, so that all rays may be brought to bear upon the lesion. The hardness of the rays, which depends upon the hardneses of the tube, and which can be changed at will when a Coolidge tube is used, varies in our treatments according to the depths in which the rays shall be absorbed. The effect of the rays is probably greatest in those tissue layers where they are absorbed, not in those which they penetrate. For tumors in the cutis and superficial layers of the subcutis we use rays of 3-5 Benoit penetration. In large fungous tumors we used rays of 6-8 Benoit penetration.

When treating according to these principles, many of our patients required only one erythema dose for a clinical cure; some rather advanced tumors required repeated radiation, which was given at intervals of about three weeks. In one case of an unusually large fungous tumor we repeated the erythema dose at intervals of a few days to two weeks until the epithelioma undoubtedly showed signs of regression. No damage to the skin was done, special care for its protection having been taken.

Fig. 14—Before Treatment.

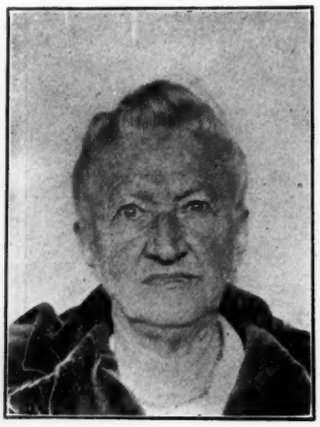

Fig. 15—After Treatment.

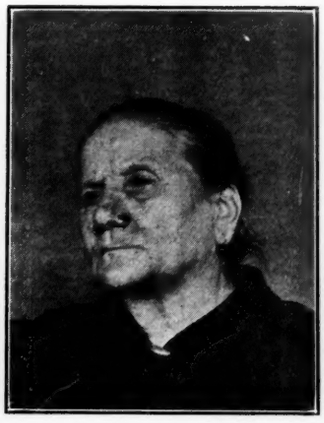

Fig. 16—Before Treatment.

Fig. 17—After Treatment.

A comparison of the different methods of treatment which we used gives the following result:

Excision	100%	clinical cures
Radium application	50%	" "
X-ray application,		
fractional dose method	69%	" "
massive dose method	97%	" "

The highest percentage of clinical cures has been obtained by surgical procedure and by heavy *x*-ray treatment, both of which a patient can get everywhere without great expense.

When shall we advise a patient to be operated? When shall we apply *x*-rays?

The excision of a basal cell epithelioma is usually only a minor operation which can be made under local anesthesia. If done aseptically the wound heals within 8-10 days with a linear scar. The condition essential for such a perfect result is that we can operate within healthy skin and yet have

sufficient skin to close the defect. It is the consideration of the cosmetic effect which so often causes the surgeon to fail to reach the safety zone. Sometimes the localization of a basal cell epithelioma is unfavorable for exciison, e. g., the nares, the tip of the nose, the nasolabial grooves. That our percentage of clinical cures is higher with operative treatment than with *x*-ray treatment is due to the fact that we only operated on carefully selected cases while cases were admitted to *x*-ray treatment just as they came in, whether beginning or advanced.

It is an advantage of the *x*-rays that they can be applied on all parts of the body surface and against lesions which are so far advanced as to be inoperable. The time necessary for healing is decidedly longer than that with an operation, but the chances for complete success are much greater. Almost unconsciously we expose the *x*-rays a much larger area of healthy skin than we would excise in an operation. In order to excise all malignant tissue which *probably* may exist in the neighborhood of lesions, we usually have to sacrifice large portions of healthy skin, while, when using *x*-rays, the healthy skin which has been exposed to the rays remains intact and yet all malignant tissue beneath it has been destroyed.

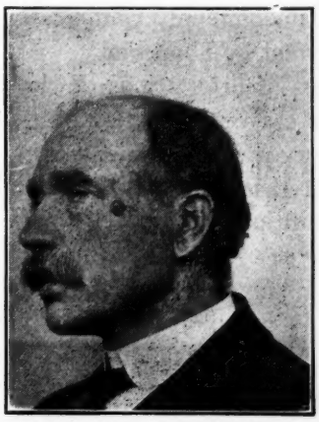

Fig. 18—Before Treatment.

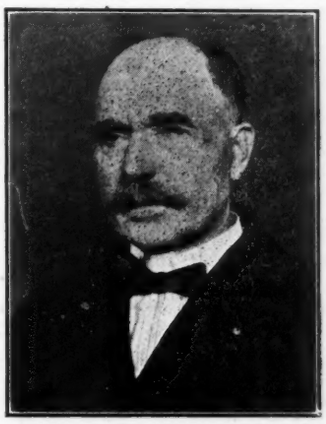

Fig. 19—After Treatment.

There is one dangerous feature in *x*-ray treatment of skin epitheliomas, and that is the tendency toward underdosing. As long as we treated with numerous small *x*-ray doses the percentage of our clinical cures was only 69% and we saw a few cases become refractory against the rays. On the other hand since we instituted massive dose treatment we have had 97% of clinical cures and we have not met one basal cell lesion that was refractory. Among our patients were quite a few who had had *x*-ray treatment elsewhere without success and who only reluctantly submitted to a renewed *x*-ray application. One or two erythema doses were sufficient in every one of them to produce a clinical cure. At present we no longer operate basal cell epitheliomas except for purposes of research. We treat them with erythema doses of *x*-rays and are well satisfied with the clinical results. When we emphasize the danger of underdosing, we do not mean, however, to recommend a reckless indiscriminate radiation of skin cancers with the causation of severe burns. What we advocate, is the application of such doses of *x*-rays as will secure the maximum destructive effect on the cancer cells and yet do no permanent injury to the skin. This dose has been reached with our machine and our treatment tube when a simple erythema of the surrounding skin appears after a few days. It is true that this massive dose treatment can only be given by experienced radiologists, who are well acquainted with the output of their *x*-ray equipment and know the erythema doses of their individual tubes and for the different kinds of rays.

We know well, of course, that a clinical cure is not yet a permanent cure. As to the length of time which must elapse after a clinical cure has been obtained and before a permanent cure can be pronounced, opinions differ widely. Experience shows that the closer all cases of epithelioma with clinical cures are followed, the more this period of observation must be prolonged. Without entering into a discussion of this difficult question, it does not seem improbable that in explaining especially later recurrences, not only anatomical local factors (incomplete destruction of the lesion) have to be considered, but also the resistance of the whole organism against the development of malignant neoplasms. More recent researches into the etiology of cancer seems to indicate that in the development of

cancer, besides local factors as chronic irritation, chronic infection, misplaced cells, etc., a more general change in the cell-metabolism of the whole organism also plays an important part. This, too, holds true for the basal cell epitheliomas of the skin, and makes us hesitate to pronounce a permanent cure, even after years of observation. Moreover, the multiplicity of primary basal cell tumors in an individual is an established fact. Such a microscopic primary focus may be present and be unnoticed in the neighborhood of a larger lesion and escape treatment. It continues to grow and will later cause an apparent "recurrence." As basal cell tumors are usually of exceedingly slow growth this may take years.

The period of observation of our patients varies between several months and 3½ years. For pronouncing a clinical cure it is not sufficient that an ulcerated lesion is simply healed over. One of our patients had a small ulcerated epithelioma in the cheek. It was treated with many small *x*-ray doses without success, but healed over after two applications of radium, leaving a slightly elevated scar. During months of observation this scar did not show any sign of clinical recurrence. For reasons of research the scar was excised and we found beneath the new formed skin some still malignant tissues of basal celled type. Very often slight elevations or thickenings remain at the site of the healed lesion. These thickenings have, therefore, to be looked at with the greatest suspicion and the treatment has to be continued till they have absolutely disappeared. With this precaution, a recurrence will be very exceptional. We have at various times excised such scars and examined them microscopically, and have never found any sign of malignancy.

REFERENCES.

Krompecher: Der Basalzellen Krebs, 1903.

Borrman: Ztschr. F. Krebs forchg, 1904, Bd. 2.

Mallory: Principles of Pathologic Histology, 1914, p. 371.

Henry Hazen: Book on Skin Cancer, 1916.

Heidingsfeld: Journal Cutaneous Diseases, 1913, XXXI 379.

McKee & Remer: New York Medical Journal XCVII, p. 633.

Pusey: Journal American Medical Association, 1913, LXI 552.

Braun: Archives for Clinical Surgery, 1892, Bd. 43.

Friboes: Beit. Z. Klein u. Histopath der Gutartigen Haut Epithelioma, Berlin 1912.

Barber: Basal Cell Epithelioma, New York State Journal Medicine, Vol XV, 1915.

Boggs: The Treatment of Epithelioma by Modern Radiation, New York Medical Journal, 1915, CII p. 38-43.

GALL-STONE DISEASES COMPLICATING PREGNANCY.

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A careful analysis of the reported cases of cholelithiasis complicating pregnancy, taken in conjunction with my clinical experience in analogous cases, justifies, I believe, the following conclusions:

1. Gall-stone disease occurs with far greater frequency among women than among men; with far greater frequency among women who have borne children than among women who have remained sterile. Its period of greatest incidence is the child-bearing period.

2. Gall-stone disease, alone or associated with one or more other related or non-related pathological state, not uncommonly complicates a pregnancy otherwise normal or abnormal.

3. The first manifestations of cholelithiasis may date from the existing gestation or from a previous pregnancy; may precede, coincide with, or follow an abortion or premature labor, accidental or induced.

4. All conditions that are associated with, that favor or cause: (a) bile stasis; (b) inflammatory or degenerative changes involving the gall-bladder or bile tracts; (c) pathological alterations in the composition of the bile, such as hypercholesterinamia, etc., predispose to gall-stone disease.

5. Bacterial organisms are said to be the most essential cause in the majority of gall-stones. In this connection one should not ignore the relation of mouth and teeth infections to appendicitis and cholecystitis.

6. Pregnancy is an important etiological factor in the causation of cholelithiasis.

7. The pathology of gall-stone disease complicating pregnancy is the pathology of gall-stone disease occurring in the non-pregnant. There may be present: (a) an inflammation of the gall-bladder or bile ducts in which one, two, or many calculi are lodged, or impacted; (b) a distention of the gall-bladder or bile ducts by mucus, pus, or calculi; (c) a pericholecystic inflammation, calculous in origin, leading to adhesion formation, to fistula formation, etc.; and corresponding disturbances of function; (d) changes in the liver; (e) changes in the pancreas.

8. Stones may precede the presence of inflammatory changes in the gall-bladder, may be associated with and be the cause or effect of cholecystic inflammation, slight, moderate, or severe.

9. Some of the symptoms of gall-stone disease are due to the irritation inherent to the presence

of gall-stones, to their migration through, or impaction in the bile ducts or neck of the gall-bladder. Other symptoms are due to the concomitant inflammation of the gall-bladder, bile ducts and neighboring organs, causative of, or resulting from the presence of calculi.

10. Rupture of a gall-bladder distended by calculi, by fluid, mucous or purulent in nature, can occur during gestation or during or immediately after labor.

11. To arrive at an accurate diagnosis, it is important to have: (1) an exact history, including the record of previous attacks of hepatic colic; (2) to determine the location of the pain and tenderness and the nature and radiating character of the former; (3) to make a thorough examination, including a careful inspection and palpation of the abdomen, especially of the hypochondriac region; (4) to exclude such pathological conditions as simulate gall-stone disease, lead colic, renal colic, duodenal ulcer, nephrolithiasis, chronic appendicitis, movable kidney, infection of the genital tract.

12. In the differential diagnosis of this condition, one should bear in mind:

a. That not infrequently gall-stone disease originates during, or may complicate pregnancy;

b. That cholelithiasis and cholecystitis, owing to their reflex symptoms, are often mistaken for gastric disease;

c. That appendicitis and gall-stone disease frequently co-exist;

d. That digestive disturbances associated with acute pain and tenderness in the right hypochondriac region, with or without jaundice, with or without symptoms of biliary colic are in themselves ample justification for operative exploration of the gall-bladder and ducts.

13. Cholelithiasis is a surgical disease; it calls for operative relief. Medical measures in this disease are merely palliative; appropriate surgical measures are curative.

14. Gall-stone disease is in itself never an indication for the artificial termination of pregnancy.

15. Whenever, for some cause or other, the abdomen is opened, in women of the child-bearing age or past the child-bearing period, the gall-bladder and larger bile ducts should be examined if it can be done: (a) without or with only slight traumatizing of the tissues; (b) without exposing the patient to too much additional risk; (c) without contaminating a clean peritoneum. Should the patient give a history of chronic digestive disturbances the indication is absolute.

16. Women exposed to pregnancy, suffering from calculous cholecystitis or any other form of gall-stone disease, should be operated upon, the calculi removed, and the gall-bladder drained.

17. Pregnancy does not contra-indicate operations upon the gall-bladder or bile tracts. Peterson reported only 3 miscarriages in 23 reported operated cases. In only one (Roith) of the cases which we considered, did abortion follow the operation.

18. It has been repeatedly demonstrated that the operative relief and cure of cholelithiasis does not unfavorably influence gestation, does not unfavorably influence parturition. Icterus, whether acute or chronic, is a constant menace to the fetus.

19. Early operation is now, in proper hands, a safe procedure. It is an effectual cure of the symptoms produced by gall-stones; it has a low mortality and guarantees against serious complications in the future.

20. Cholecystostomy, cholecystectomy, and choledochotomy have been successfully performed upon pregnant women for the relief of gall-stones. After these operations, drainage is to be employed until the bile ceases to flow spontaneously through the wound, until complete subsidence of whatever degree of cholangitis existed.

21. Cholecycystostomy is the operation of election:

1. Whenever the patient's condition is so bad that the difficulties attending a cholecystectomy render its performance unsafe.

2. When the gall-bladder is not seriously damaged and when the cystic duct is not ulcerated or narrowed by stricture. It is believed that the gall-bladder has some other function than that of a mere receptacle of bile.

3. When the common duct is strictured.

4. If jaundice and pancreatitis be present.

22. Cholecystectomy is indicated:

1. For very thick, acutely inflamed, or gangrenous gall-bladders in which a stone is impacted in the cystic duct.

2. For chronically thickened gall-bladders. A thick walled gall-bladder which has become functionless should always be removed. When the gall-bladder becomes thickened and hardened from long continued inflammation, it is manifestly impossible that it should dilate no matter what obstruction there may be in the common duct.

3. For large gall-bladders distended with clear fluid and resulting from the impaction of a stone in the cystic duct.

4. For the "strawberry" gall-bladder chronic thickening with ulceration.

5. For a calculous gall-bladder adherent to the stomach, intestine, or omentum.

6. When the walls of the gall-bladder are so modified by disease that neither the storage nor the expulsion of bile is possible.

23. It is agreed that cholecystectomy is attended with more technical difficulties than cholecystostomy. It requires greater care to avoid injury to the bowels, vessels and the main bile ducts. It is wiser to choose the safer operation until the technic of the more complicated one has been mastered.

24. The prognosis of operative intervention is not unfavorably influenced by the existence of pregnancy.

25. In persistent gall-bladder disease, pathologic changes in the urine, manifested by the presence of casts and albumen, are not uncommon and are not necessarily a bar to operative interference.

WHIRLPOOL BATHS.

The whirlpool baths, first used in France during the war, are the most valuable single appliance in the after-treatment of wounds. The arm or leg is plunged into a vessel containing water at about 105 degrees which is circulated by jets, set at an angle, or by a propeller. Air is also introduced so that the limb is surrounded by a swirling, bubbling current, the temperature of which is raised as high as 120 degrees if the patient can bear it. The air bubbles increase the stimulant effect on the skin and the heat is applied to the surface far more surely by this means than if the water were still. These baths are particularly effective for painful stumps, painful scars, partial paralysis or in fact any condition which lowers the circulation and nutrition of the member. The period of treatment is about twenty minutes and the part, made warm and comfortable, is then ready for massage and manipulation, which could not have been performed without this preparation.—R. TAIT MCKENZIE, M. D., Major, R. A. M. C., in *American Physical Education Review.*

THE PREVENTION OF GAS PAINS.

1. Clinical and experimental observations strongly suggest that preoperative purging is a strong factor in the producing of gas pains.

2. At operation the strongly purged bowel is more difficult to handle than the unpurged bowel on account of congestion and distention.

3. An enema will clear the lower bowel sufficiently for any operative work.

4. Patients who have not been purged are comparatively free from gas pains.—L. A. EMGE, M. D., in the *Journal American Medical Association.*

UROGENITAL TUBERCULOSIS; CASE REPORT.

CLAUDE G. HOFFMAN, M.D.,
LOUISVILLE, KENTUCKY.

In October, 1917, a man twenty-four years of age, from the interior of Kentucky, was accepted for service in the United States Army and sent to one of the training camps. According to the history obtained from the patient, about a week after reaching the camp he developed a severe cough, with elevation of temperature, night sweats, etc., and shortly thereafter had a pulmonary hemorrhage, two or three teacupfuls of blood being expectorated.

Examination of his sputum at that time disclosed abundant tubercle bacilli, and the diagnosis of pulmonary tuberculosis was accordingly made. The patient was then sent home, where I understand he was treated by the family physician in the routine way, *i. e.,* by the internal administration of drugs, by being kept in the fresh air, proper attention to diet, personal hygiene, etc.

During January and February, 1918, he complained of pollakiuria, vesical tenesmus, etc., and since October, 1917, had lost about seventeen pounds in weight. I might mention, in passing, that he gave the history of Neisserian urethral infection two years previously, for which he was treated and pronounced cured.

March 14th, 1918, when I first saw him he had acute urinary retention; his prostate was found so large that satisfactory palpation was impossible, and no cystoscopic examination could be made. The prostate was hard and nodular, and the diagnosis of tuberculous involvement seemed certain. The prostatic infection was secondary, and the case shows the rapidity with which tuberculous involvement of the urogenital tract may develop from the original pulmonary infection. It is interesting to note that the pulmonary lesion had remained practically quiescent during the time the patient was being treated at his home. Only the middle lobe of the right lung showed any appreciable physical signs, cough had been slight, and temperature about normal.

During my examination of the prostate I must have ruptured a small intra-capsular abscess, because about half a dram of pus was expressed from the urethra. Microscopic examination of the pus revealed the presence of tubercle bacilli in great abundance, and culture of the same material showed staphylococcus albus and gram negative bacilli probably B. coli. As the culture showed a mixed infection an autogenous vaccine was prepared from the

prostatic excretion under the belief that its administration might produce some benefit. After the second injection of vaccine the patient's temperature became normal and remained so until he was sent home on April 20th.

This man returned to Louisville June 1st, 1918, suffering severe pain in the prostatic region and also in the right testicle. Examination showed that there had developed during his absence a typical right epididymo-orchitis. Temporizing methods of treatment were employed until June 30th, when indications of suppuration and tissue destruction appeared, two small scrotal sinuses having developed.

On July 8th an incision was made through the scrotal wall and tunica vaginalis exposing the testicle and spermatic cord, which were found densely adherent to the tunica vaginalis and incorporated in a mass of caseous material and pus; there was not an area of uninvolved testicular tissue larger than a pea. The entire mass was excised the cord being ligated and divided three inches above the external abdominal ring. The progress of the case was uneventful, the wound healing without sinus formation. The patient was sent home August 8th, with instructions to report in about a month for further observation.

By September 10th he had gained fourteen pounds in weight. Examination showed the prostate perceptibly decreased in size, and while it was still hard and nodular it was not sensitive to palpation. The urinary stream was free and there was no tenesmus. The patient was able to retain his urine eight hours without discomfort. Cystoscopy at this time revealed a typical tuberculous bladder; much difficulty was encountered in locating the ureteral orifices on account of the trabeculations. Urethral catheterization was finally accomplished and unilateral (right) renal tuberculosis demonstrated. Cystoscopy also showed both lateral lobes of the prostate protruding into the vesical cavity.

On October 2nd, 1918, epididymo-orchitis developed on the previously unaffected (left) side; the patient suffered intense pain, and the swelling and tenderness extended at least four inches above the internal abdonimal ring. His temperature at this time varied between 101° and 102°F. Temporizing methods were used until October 24th. During the interim anorexia was marked and the patient lost about sixteen pounds in weight.

On October 24th he was again operated upon. The left testicle and cord were found in about the same diseased condition as the right had previously been. The whole mass was removed, the cord being ligated as high as possible. The second day after the operation the temperature became normal, appetite returned, and steady improvement has continued until the present date, November 5th, 1918. The patient has gained six pounds in weight and says he feels well.

My principal reason for reporting this case is to show the rapidity with which urogenital tuberculosis may sometimes follow the primary pulmonary infection. Of course the prognosis is exceedingly grave. Strange to say, the pulmonary lesion has remained quiescent, there having been no cough nor other symptoms referable to the lung for at least four months.

SELF-GOVERNMENT BY INTERNES.

The medical service of the modern hospital is not only a place for fitting young men recently graduated from our medical colleges to care properly for the sick; it is also an educational institution. At the termination of an internship these men go forth to engage in the activities of life with a personal responsibility, each one acting his part in the many medical, social and economic problems, each an honored member of a noble profession. In order best to meet these obligations young men need to have placed upon them, during the years of preparation for life service, responsibilities associated with their training and experience. Self-government, as it appears to me, has a practical application in its relation to young men; I might say, equally so to young women; and I predict that a modified form of self-government will in the near future be introduced in many of our hospitals and schools of nursing.—CHARLES B. BACON, M. D., in *The Modern Hospital.*

SOME DON'TS FOR BURNS.

There are some things that should not be done to a burn, and some of them are these: Never use an antiseptic of any kind on a burn except of the mildest sort, because its caustic action will eat off the new cells and cause a maximum of scar tissue formation; never use salves or grease of any kind, as they will surely cause sloughing and infection; never allow the cotton or gauze in your dressing to come into contact with the wound, as it will act as a mechanical irritant and the new cells growing into the meshes will be pulled off when the dressing is removed; never apply a powder or dry dressing, as the serum will dry, forming a crust under which it will rapidly stagnate and decompose.—C. T. THOMPSON *in the International Journal of Surgery.*

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WALTER M. BRICKNER, M.D., F.A.C.S., Editor

NEW YORK, JANUARY, 1919.

NINETEEN HUNDRED AND NINETEEN.

A Happy New Year is the cordial wish of the AMERICAN JOURNAL OF SURGERY, not merely to its subscribers, but to the entire medical profession.

As the affairs of the Nation and the world tend to reach equilibrium, may there be a complete resumption of medical activities along normal lines. The accomplishments of surgery during the war reflect most creditably upon the profession. Ninety per cent. of the wounded attended within six hours after injury recovered. Ninety-five per cent. of those who reached base hospitals were restored to lives of relative usefulness. Probably less than ten per cent. of all the injured during American participation will require re-education in order to fit themselves into the scheme of life prepared to cope with all circumstances. This signal victory of the constructive forces of the Medical Department reflects the enthusiasm and devotion of the military surgeons.

From the trials of war to the tests of peace there is but little transition. The current of medical life flows on, laving the shores lined with the afflicted with its healing waters.

May 1919 be a year enriched by discovery, distinguished by service, and fraught with the highest benefits to humankind, and may the medical profession find an imperishable reward of honor and glory in its efforts and achievements.—I. S. W.

THE NEWER LUNG SURGERY.

Those who were fortunate enough to hear the addresses of the visiting foreign surgeons at the College of Physicians and Surgeons and at the New York Academy of Medicine in the early November days will not soon forget these memorable occasions. They were all inspiring addresses, especially in the setting of spontaneous patriotic fervor that marked those days. They were set forth with a remarkable lucidity and grace of diction; charged with big and novel surgical principles and bearing a message of profound import not only to war surgery, but to surgery of civil life.

The remarks of these surgeons could easily furnish sufficient material for a dozen editorials, but we have selected for comment in this number their experiences in lung surgery, because this was perhaps the most startling feature in their addresses. This phase was beautifully set forth by Major Duval, the daring originator of the latest treatment of wounds of the chest and lung, whose French, by the way, was worth going miles to hear. He traced the evolution whereby his present methods were obtained and no one could accuse Duval of Chauvinism when he pointed out that certain German principles, such as the teaching of the exaggerated dangers of artificial pneumothorax and the necessity of handling the lung with special instruments, had retarded the progress of lung surgery appreciably. In the early days of the war expectant treatment of lung wounds had proven disastrous, as a mortality of 45 per cent. eloquently testifies. The stimulus to Duval's temerity in treating lung wounds was afforded by the discovery of the now well established principle of treating war wounds (also, we believe, first originated by French surgeons) by excision of traumatized tissues and primary sutures. He, therefore, applied this principle to the treatment of lung wounds and soon found that the lung, like other tissues of the body, need not be handled with the timidity with which it had hitherto been accustomed. He also found that the dangers of an artificial pneumothorax had been tremendously exaggerated. Essentially, therefore, the method devised by Duval consists in wide exposure of the chest cavity, producing a complete pneumothorax with prolapse of the lung: pulling out and exposing each lobe of the organ, and treating the wound in the same manner as a wound in any other part of the body, followed by complete closure of the thoracic cavity, without drainage.

With this technic, wounds of the lung are treated according to three indications: 1. Hemorrhage.

2. Threatening asphyxia. 3. When the lung wound was such as to probably promote infection. In the first two indications, the method resulted in the saving of 65 per cent. of the men threatened with death from hemorrhage. In the chest wounds with lung lesion, the danger came from infection from the wound itself or from the foreign body. In this class of cases, the mortality had been reduced from 30 per cent. to 9 per cent. As an indication of the marvelous possibilities that this method brings with greater surety of indication and technic, Duval cites the fact that in *the last 33 cases of lung wounds there was no death.* In addition, the cure obtained by this method is better than that obtained by any other method, because it left the function of the lung perfect. Truly, it may be said, that Duval's work is a revelation.

Bastianelli, the renowned Italian surgeon, corroborated all of Duval's assertions, and in addition, made a recommendation of his own, which, it seems to us, will prove to be a large contribution in the treatment of lung wounds. He advises in certain cases of closed lung wounds with intrapleural hemorrhage that, instead of making an artificial pneumothorax and closing the lung wound, the blood be aspirated and at the same time air be introduced into the pleura so as to keep up the compression, which, in Bastianelli's experience, is the dominant factor in arresting pulmonary hemorrhage. His statistics certainly prove his contention. In 290 cases of penetrating wounds, death occurred in 18. 206 of these patients had closed chest wounds, and of these seven died; 84 had open chest wounds, of whom 11 died.

Our interest in this topic has aroused us to look up the original papers of Duval, so that we might inform ourselves more thoroughly concerning the details of the principles, technic and indications, of which the above summary is merely a bare outline. We find that the best resumé of his work is published in *War Surgery and Medicine,* June, 1918, Vol. 1, No. 4, published by the Surgeon General. We advise everyone interested in this fascinating field to read this report.—E. M.

THE ETIOLOGY OF THROMBO-ANGIITIS OBLITERANS.

The condition named Thrombo-Angiitis Obliterans, by Buerger, has never been fully understood or explained. Why the disease should attack males, particularly Jews of the poorer classes of Eastern Europe; why it should choose as its site nearly always the feet, are questions that have received but little light. The studies of Buerger have been generally accepted, and it has been conceded that the pathology is one of thrombotic obliteration of the blood vessels to the extremities.

In 1916 Willy Meyer suggested that patients suffering with this disease would benefit when treated by repeated injections of Ringer's solution. At that time, too, he quoted Garbat, who demonstrated that these patients might all be classed in one group, according to the iso-agglutinins in their circulating blood. There seemed, therefore, even at that time, a strong likelihood that the clinical manifestations might be attributed to a common underlying etiology.

Quite recently Willy Meyer has announced that in these patients the ingestion of 100 gms. of glucose by mouth, will always produce a hyperglycaemia. He, therefore, names the disease "glycophilias." It would thus seem that there is a metabolic fault responsible for the disease, and that we must look in a new direction for a proper appreciation of its etiology. H. R. M.

Surgical Sociology

Ira S. Wile, M.D., Department Editor.

IRON, STEEL AND SAFETY.

In few fields of industry has there been greater or more successful effort to reduce accidents than in connection with the manufacture of iron and steel. *Bulletin 234* of the *United States Bureau of Labor Statistics* deals with "The Safety Movement in the Iron and Steel Industry, 1907 to 1917." This period practically embraces the entire time period of the Safety First Movement.

The accident rate during 1907 was unusually high and the intrinsic hazards in the iron and steel industry were recognized as so important as to warrant an attempt at mitigating the dangers to employees. The idea of accident prevention had not been sponsored by any large organization and legislation for accident compensation had received comparatively little attention. Slowly, however, there developed in the iron and steel industry an increasingly vigorous attack upon accident rates which has resulted in almost a steady decline during the period of ten years, with the exception of a slight upward movement occurring about the middle of 1915 because of the introduction of new labor elements and the migration of labor from place to place under the unusual conditions created by war, then well under way across the ocean. The very trials and stresses incident to the production of war materials served as a test of the efficacy of the Safety First Movement. In some

branches of the industry the accident rates continued to decline, while in other branches the accident rates mounted rapidly. Where organization for the prevention of accidents was most effective, the increased industrial activity did not result in very high rates, and within the year the disability rate began to decrease again, despite the fact that the number of workers employed was continually increasing.

The accident experience of one large steel plant will suffice to indicate the excellent progress which has been made in the iron and steel industry, despite the fact that it represents an organization above the average level of the entire industry. In 1905, with 6,406 300-day workers, the accident frequency rate (per 1,000, 300-day workers) was 300, while the accident severity rate (days lost per 300-day worker) was 34.5. In 1914, the number of 300-day workers had fallen to 4,741 with an accident frequency rate of 74, and an accident severity rate of 12.2. For 1917, the same plant possessed 10,862 300-day workers, with an accident frequency rate of 85, and an accident severity rate of 12.9.

The accident severity rate is a much truer index of accident hazard than is the frequency rate as it demonstrates the influence of the injury upon the welfare of the workers and upon the productive activity of the industrial plant. These figures calculated for a group of plants, constituting about 25 per cent. of the entire iron and steel industry of the country, show a decrease of the accident severity rate from 27.1 in 1907, to 10.9 in 1914, and 10.2 in 1917. For the same group of plants, the accident frequency rate fell from 242.4 in 1907, to 112.7 in 1914, and 81.0 in 1917. The frequency rate thus declined 67 per cent., while the severity rate decreased 62 per cent.

It is patent that in any industry various departments will present different rates of accidents and severity. The main factors entering into these differences consist of, first, the intrinsic hazard of the department; second, the flux of industrial workers; third, the efforts made at accident control.

The effect of the war period up to 1918 may be measured in part by a consideration of fatality rate in the industry and the general frequency rates from 1913 to 1917. In December, 1913, with 153,098 300-day workers the fatalities per 1,000 300-day workers were 1.34, while the total accident rate was 181.0. In December, 1914, these figures were respectively 117,214, 70, and 130.4. By June, 1916, the figures had risen to 160,819, 1.09, and 134.1. It is evident that while the general frequency rate increased, it was by no means as rapidly as the rate of employment. About the middle of 1916, the total accident rate began to decline and a little later the fatality rate began to fall, despite the fact that employment was continuing to increase. This downward movement of accident rates becomes more significant when one realizes that the general tendency is toward an increase in the accident rate when recovery from industrial depression demands the introduction of new men as workers. Therefore, the fact that in December, 1917, there were 186,357 300-day workers with a fatality rate of only .98 and a total accident rate of only 103.4 is all the more creditable to the successful accomplishment of the Safety First Movement in the industry.

Compensation laws and the organized Safety First Movement have given marked stimulus to plant managers who have begun to appreciate that accident prevention possesses economic as well as humanitarian benefits. Laying aside the consideration of the human factor in accident occurrence, it is manifest that serious industrial accidents may be greatly reduced by the improvement of physical plant and by securing conditions of employment that make for safety in spite of human carelessness, ignorance, and dereliction.

The progress of the Safety Movement in the iron and steel industry, which, incidentally, possesses intrinsically the greatest industrial hazards, offers a challenge to the industrial world and marks an understanding of the value of human life such as has not been fully appreciated in various other fields of human labor. The iron and steel industry, humanitarianly speaking, becomes the bulwark of accident prevention as it has been economically a stronghold in the support of national activity and progress.

POISONING BY AUTOMOBILE FUMES

To prevent poisoning from automobile fumes the following precautions should be taken: Have good ventilation; do not run the motor in a small, insufficiently ventilated garage; do not run it unnecessarily; put alcohol and glycerine or some other non-freezing mixture in the radiator; use good gasoline; do not use too much oil. If you must work in a confined space wear a gas mask or attach a rubber hose to the end of the exhaust to carry the fumes off outside. A warning sign should be posted in every garage. Future improvements in the automobile to prevent sickness and deaths from automobile fumes might be a tank to absorb the poisonous gases or a practical electric battery for out of town use.—H. J. BLUMENSOHN, M.D., in *The Medical Record*.

Book Reviews

Abstracts of War Surgery. Prepared by the Division of Surgery, Surgeon-General's Office. Octavo of 430 pages. St. Louis: C. V. Mosby Company, 1918. Price, $4.00.

This volume contains abstracts of the war literature of general surgery that has been published since the declaration of war in 1914. The abstracts are listed under the following headings: general topics; wound infection and treatment; tetanus; abdomen; chest; cardiovascular surgery; joints; fractures; burns; anaesthesia in warfare; trench-foot; peripheral nerve injuries; jaws and face. The abstracts have been very excellently done and many of the original papers have been reviewed in these columns on previous occasions. For those interested in military surgery the volume is helpful in furnishing a rapid method of reaching all the available literature of the present emergency on the required topic.

Gunshot Fractures of the Extremities. Joseph A. Blake, Lieutenant-Colonel, Medical Corps, U. S. A. Small octavo of 150 pages and 40 illustrations. Paris: Masson et Cie, 1918.

This small monograph was originally intended to form part of a large work to be prepared by Doctor Stimson for the Council of National Defense. It details the experiences of Colonel Blake—and these have been very extensive in the treatment of gunshot fractures of every variety. Some of the matter contained in the volume had been previously published in French and American journals, and some of these have been previously reviewed in these columns. The volume is very complete and should be of great help not only to military surgeons, but also to the civil practitioner, since many of the principles made us of could be used advantageously in civil injuries of the bones. Much space is given to the suspension method of treating fractures.

Books Received

Les Borgnes de La Guerre Prothese Chirurgicale & Plastique (Valois et Rouveix). Par Le Dr. G. Valois Membre de la Societe d'Ophthalmologie de Paris. Planches Hors Texte Dessinees Par G. Reynard De La Societe Des Artistes Francais. Masson Et Cie, Editeurs. Libraires de L'Academie De Medecine 120, Boulevard St.-Germain, Paris, VI. 1918.

Gunshot Fractures of the Extremities. Joseph A. Blake, Lieutenant-Colonel, Medical Corps, U. S. A. Masson Et Cie, Editeurs. Libraires De L'Academie

The Doctor in War. Woods Hutchinson, M.D. With De Medecine 120, Boulevard St.-Germain, Paris, 1918. illustrations. Boston and New York: Houghton Mifflin Company. The Riverside Press, Cambridge, 1918. Price, $2.50.

Applied Bacteriology. Studies and Reviews of Some Present-Day Problems for the Laboratory Worker, the Clinician and the Administrator. Edited by C. H. Browning, M.D., D.P.H., Director of the Bland-Sutton Institute of Pathology, the Middlesex Hospital. Contributers: C. H. Browning, W. Gilmour, R. Gulbransen, T. J. Mackie, S. Russ, J. F. Smith, L. H. D. Thornton. Henry Frowde, Hodder & Stoughton, *Oxford University Press*, Warwick Square, E. C., 1918. Price $2.50.

Progress in Surgery

A Résumé of Recent Literature.

Open Pneumothorax: Its Relation to the Treatment of Empyema. Major E. A. Graham and Capt. R. D. Bell, *American Journal of Medical Sciences*, December, 1918.

Graham and Bell carried out an extensive and painstaking series of animal experiments to prove the thesis laid down by the empyema commission that the empyema resulting from streptococcus hemolyticus infection should be treated by the method of deferred operation. One of the principal considerations which led to this opinion was the question of harm to the patient caused by the creation of a pneumothorax in the presence of an already existing severe asphyxia. The work was carried out according to the following lines: 1. A study of the effects of open pneumothorax in normal and diseased chests. 2. Experimental production of streptococcus empyema and pneumonia. 3. A study of the effect of early operation in dogs with experimentally produced empyema. The results obtained from their observations confirm those which the commission derived from their clinical experiences.

The authors summarize their results in the following manner: From the standpoint of pressure relationships the normal thorax may be regarded as one cavity instead of two. Any change of pressure in one pleural cavity is accompanied by practically an equal change in the other, so that an equilibrium of pressure exists at all times throughout the whole thorax. In our experiments the changes of intrapleural pressure have been accomplished only with air, but probably the same conclusions would hold for those effected by fluid

The prevalent conceptions of pneumothorax are erroneous in that they are based on the assumption that when an opening is made into the chest one lung is collapsed and the other maintains respiration. This assumption implies that the mediastinum constitutes a rigid partition between the two pleural cavities. On the contrary, the mediastinum is so mobile that any increase of pressure in one pleural cavity pushes it over into the opposite one so that both lungs are compressed practically equally. No such condition is possible, therefore, of collapse of one lung and maintenance of respiration with the other in a chest with a normal mediastinum.

If, on the other hand, the mediastinum has been made rigid by induration as a result of long-standing inflammation, or if it has become fixed by adhesions, then a pleural opening on one side will not produce the same pressure changes in both pleural cavities.

The maximum opening into a pleural cavity compatible with life depends upon a definite relationship which exists between the amount of air entering the lungs and the amount which enters the pleural opening. The maximum opening compatible with life may be approximately determined for the normal chest by the mathematical expression given in the text. By this mathematical expression it is found that a normal human adult should be capable of withstanding for a short time an opening of about 51.5 sq. cm. (5x10 cm., or 2x4.1 inches). There is no discrepancy, therefore, between our experimental results and the finding at the front that men are capable of maintaining respiration with gaping thoracic wounds, which seem surprisingly large.

A double pneumothorax in a normal chest is more dangerous to life than a unilateral open pneumothorax merely because usually the combined areas of the two openings (and therefore the amount of air admitted into the pleural cavities) is greater than a single opening on one side is likely to be. Theoretically and experimentally effects of practically the same severity result in the case of one or more opnings into one pleural cavity as follow the creation of a double pneumothorax, provided that in each case the combined areas of the various openings are equal.

The bearings of these results and deductions upon both the treatment of acute empyema and upon thoracic surgery

in general is obvious. Whenever the amount of air taken into the lungs is limited by the presence of an active pneumonia, with plugging of both air channels and alveoli, whenever there is an excessive demand for air, or whenever there is sufficient weakening of the respiratory muscles to impair compensation, the size of a pleural opening compatible with life becomes smaller; and if any or all of the above factors are present in sufficient intensity, even a very small opening into the pleural cavity will produce death from asphyxia. Since all of these factors are likely to be present to a high degree during the early stage of an empyema of the streptococcus type, early operation with the establishment of an open pneumothorax carries with it an unwarrantable danger. Aspiration is indicated instead until after the above dangerous factors have disappeared.

Special emphasis has been placed in this article on the changes of intrathoracic pressure induced by an open pneumothorax, but other results, such as heat loss, danger of infection and disturbance of the systemic circulation, are of great importance.

A Study of 450 Cases of Wounds of the Chest, with Special Reference to a New Method of Treatment for Infected Hemothorax. W. HUTCHINSON, *The Canadian Medical Association Journal,* November, 1918.

1. All cases of wounds of the chest should be treated in special wards or special hospitals.
2. Careful charts should be kept which record temperature, pulse, and respirations four times a day.
3. Early diagnosis of infection is important.
4. Every case in which there is more than two fingers' breadth of dullness should be aspirated.
5. Cases of open pneumothorax should be closed as early as possible.
6. Cases in which there is a large amount of clot in the chest should be opened, blood and clot evacuated and the chest closed. This should be done as early as possible.
7. Cases in which the haemothorax is found to be infected should be opened, washed out and closed; some antiseptic being left in, preferably an emulsion of B. I. P. in liquid paraffin.
8. Post-operative aspirations must be done in all closed cases the first forty-eight hours after operation.
9. No attempt should be made at the Base Hospital in France to remove a foreign body from the lung.

Primary and Delayed Primary Suture in the Treatment of War Fractures. WILLIAM S. BAER, *American Journal of Orthopedic Surgery,* August, 1918.

The particular object of this paper is to emphasize the importance of the early treatment of war fractures by primary or delayed primary suture. It diminishes considerably the anger of infection and the hospital stay. It increases the rapidity of healing and convalescence and return to function and does away with the pain and discomfort of repeated dressings.

Les Lois de la Cicatrization des Plaies Cutanees (The Laws of the Cicatrization of Cutaneous Wounds.) AUGUSTE LUMIERE, *Revue de Chirurgie,* January-February, 1918.

Lumiere summarizes the rules as follows:

1. The activity of healing in a wound kept aseptic is the same at the beginning and at the end of the healing.
2. The time necessary for healing depends on the size of the wound.
3. Traumatisms and contamination of the wound retard the epidermization.
4. The employment of antiseptics assures the regularity of the healing.
5. The various antiseptics exercise a different action, depending on their nature, on the rapidity, or retardation, of the cicatrization.
6. Under aseptic conditions the extent of cicatrization corresponds to 1 in 20 or 1 in 30 mm., daily. Under antiseptics this was diminished to 1 in 72 mm.

The Use of Dichloramine-T and a Modified Open-to-the-Air Treatment of Burns. CAPT. W. E. LEE and CAPT. W. H. FURNESS, Philadelphia, *Therapeutic Gazette,* May 15, 1918.

The entire burned area is covered with a single layer of open meshed mosquito netting which has been previously impregnated with paraffin wax. This netting is usually easily removable without causing any pain; if it adheres it may be easily loosened by spraying with sterile paraffin oil. In addition a one or two per cent solution of dichloramine-T in chlorinated melted paraffin wax is sprayed over the entire burned area. If the burned area is extensive, a few electric bulbs properly placed in the bed prevent undue radiation of the body heat. The authors have treated 50 burns by this method, and are convinced of the utility of their method.

Anesthetic Machine. A. W. ADSON and G. G. LITTLE, Rochester, Minn., *Journal American Medical Association,* June 8, 1918.

Adson and Little describe an intratracheal anesthesia apparatus, especially adapted to be employed in work on the cerebellum and brain stem, where plenty of pure air under slight pressure is often required. The one described has been constructed to supply a constant flow of air, when needed, a constant ether tension, and a safety valve prevents too great pressure within the lungs. They claim for this machine efficiency, simplicity and ease of manipulation The description is elaborate and requires the illustrations, to which constant reference is made.

Bismuth Paste in War Surgery. EMIL G. BECK, M.D. *Annals of Surgery,* April, 1918.

The methods of primary sterilization by means of flushings with hypertonic solutions should be thoroughly tested, to determine their effectiveness without the additional use of pastes

The radical excision of infected tissues, as now practised in the war hospitals, should be adhered to, as a means of preventing chronic suppuration.

In those cases in which early sterilization was not obtainable and the wounds persist in suppurating, the bismuth paste injection or similar formulae should be employed, before another radical operation is resorted to. Correct technic in applying bismuth paste is essential if satisfactory results are to be obtained.

Bismuth paste and similar formulae are applicable in chronic suppurations resulting from war wounds, as well as in those due to chronic infectious diseases.

In the residue of cases in which the bismuth paste treatment is not effective, the sutureless skin operation should be employed, since with this method we are able to clear up nearly all of these apparently hopeless cases.

Hemorrhagic Osteomyelitis and Sarcoma in Bone. GEORGE BARRIE, *American Journal of Orthopedic Surgery,* November, 1918.

It is demonstrated that the same type of scavenger giant cell is frequently present in lesions in bone that are purely inflammatory in character, as well as in true sarcomata of bone. The term medullary giant cell sarcoma should be abolished. The diagnosis of tumor structure should be made from the predominating tumor structure. Granulation tissue proliferation filling in bone cavities should be recognized as inflammatory tissue.

Affections of the Large Joints Due to Gunshot Wounds; Their Late Results and Treatment. S. W. LEEDS, *British Journal of Surgery,* October, 1918.

For the restriction of motion following gunshot injuries, manipulation has its chief use in the correction of deformity, and in changing a bad to a useful position of the ankylosed joint. Slight movements and continuous stretching accomplishes more than sudden forcible movements. Open operation is rarely advantageous except with the elbow. Active movements are most valuable and often do more than any other method of treatment.